CLAIMS

1. An apparatus for detecting a different kind of object among objects using a plane spectrometer, comprising

a conveyer means for conveying a plurality of objects;

5   an irradiating means for irradiating near-infrared rays to the plurality of objects conveyed by means of the conveyer means;

a plane spectrometer performing plane spectroscopy for a reflected light of the near-infrared rays reflected from

10   the plurality of objects, to which the near-infrared rays are irradiated with the irradiating means;

an imaging means for converting a plane spectrogram of the reflected light produced through the plane spectrometer into an electric signal by means of a near-infrared ray

15   camera; and

an analyzing means for detecting a different kind of object from the plurality of objects using a method of main component analysis upon obtaining spectral data of the reflected light by means of analyzing the electric signal

20   obtained with the imaging means.

2. An apparatus according to Claim 1, wherein the analyzing means is configured to perform

a wavelength axis averaging processing for averaging

25   spectral data in a direction of the wavelength axis;

an interpolation processing for interpolating the spectral data using Lagrangian secondary interpolation;

a measuring position optimization processing for detecting a center position of the object by means of detecting an edge of the object upon accumulating the spectral data in a direction of a spatial axis;

5 a spatial axis averaging processing for obtaining an average value of each of the wavelengths at a plurality of points in the vicinity of the center position of the object detected by means of the measuring position optimization processing;

10 a differentiation processing for performing a first differentiation or a second differentiation for the spectral data;

a main component score calculation processing for calculating the main component score by means of

15 calculating previously obtained loading vector data and the spectral data obtained from the above-listed processes; and

a determination processing for determining whether to be the different kind of object or the same kind of object on the basis of the calculated main component score.

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3. An apparatus according to Claim 2, wherein the wavelength axis averaging processing of the analyzing means performs at least any of

a preprocessing for averaging the spectral data;

25 a preprocessing for standardizing the spectral data on the basis of a ratio of the spectral data to a predetermined value;

a preprocessing for standardizing the spectral data on the basis of a difference between the spectral data and a

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predetermined data; or

the wavelength axis averaging processing for forming a moving average of the spectral data in the direction of the wavelength axis.

4. An apparatus according to any one of Claims 1 through 3, wherein the analyzing means is configured to perform a conversion processing for smoothing the spectral data.

5. An apparatus according to any one of Claims 1 through 4, wherein the analyzing means is configured to perform a correction processing for the spectral data by means of MSC (Multiplicative scatter correction) method.

6. An apparatus according to any one of Claims 1 through 5, wherein the analyzing means is configured to detect abnormality of the object in a case that the edge exceeding a predetermined threshold cannot be detected in the measuring position optimization processing for detecting the center position of the object by means of detecting the edge of the object upon accumulating the spectral data in the direction of the spatial axis.

7. An apparatus according to any one of Claims 1 through 6, wherein the analyzing means is configured to perform the main component analysis for the object at each of the lines being conveyed in multiple lines, using the loading vector

data created at each of the lines.

8.   An apparatus according to any one of Claims 1 through 7, wherein the analyzing means is configured to perform the main component analysis selecting only data of a predetermined wavelength band in the spectral data.

9.   An apparatus according to any one of Claims 1 through 8, wherein the analyzing means is configured to perform a conditional branching processing while repeating for two or more times upon changing a condition of the main component analysis.

10.   An apparatus according to any one of Claims 1 through 9, wherein the imaging means is a rolling-type near-infrared ray camera, the near-infrared ray camera having a camera rotating mechanism whereby the near-infrared ray camera can be rotated around a shaft in parallel with a light axis thereof.

11.   An apparatus according to any one of Claims 1 through 10, wherein the conveying means comprises a sheet-like conveying device for conveying the objects, the sheet-like conveying device having a flap-inhibitor for preventing flap of the object by means of pressing a peripheral portion of the sheet-like conveying device around the object to be conveyed.

12.   An apparatus according to any one of Claims 1 through 11, wherein a light volume compensator having a predetermined reflectance property is disposed at a position within a visual field of the imaging means.